Toxicological Evaluation Of Two Named Herbal Remedies Sold Across Orumba South Local Government Area of Anambra State, South-Eastern Nigeria.

Abstract

Aim: Herbs are plants or parts of plants used for their therapeutic, aromatic or savory values. This work studied the potential sub-chronic toxic effects of Goko and BetaB, two herbal remedies used in treating human diseases and sold in Orumba Local Government Area of Anambra state, Nigeria.

Design: Experimental adult Wister female albino rats were divided into five groups (A, B, C, D and E) of five animals per group. The first and second groups received 0.1 ml/kg body weight and 0.2 ml/kg body weight of Goko while the third and fourth groups received 0.1 ml/kg body weight and 0.2 ml/kg body weight of BetaB orally. The control group was given normal feed and clean drinking water only. Administration lasted for 14 days after which the animals were sacrificed by cervical dislocation and blood samples collected for biochemical assay.

Results: The results of serum alanine amino transferase (ALT), aspartate amino transferase (AST), alkaline phosphatase (ALP) activity and concentration of serum total bilirubin and albumin showed varying significant ($P < 0.05$) differences when compared with the control.

Conclusion: Result obtained from this study seems to suggest that Goko and BetaB may not be safe for use sub-chronically at high doses.

Key words: Herbal remedies, Goko, BetaB, Albino rats, Toxicity, Biochemical assay

1.0 Introduction

Herbal remedies are usually herbal preparations employed medically to treat or manage different ailments. They consist of different parts/portions of plants. Herbal remedies are crude, unpurified plant extracts containing several constituents[1] It is believed that the different components work synergistically to exert therapeutic effect. Herbal medicine or

herbalism equally can be seen as the use of herbs or herbal products for their therapeutic or medicinal value [2] They are most commonly made from leaves, roots, bark seeds, and flowers. They are eaten, swallowed, drunk, inhaled, or applied topically to the skin. They contain a variety of naturally-occurring phytochemicals which are chiefly responsible for their health effects [3].

Herbal remedies were the only source of medication in pre civilization time and remains the alternative to orthodox medicine in many countries today. It is still the main source of healthcare in many third world countries as it is estimated that over 80% of the population still depend on traditional/herbal medicine for their healthcare needs [4]. There is an upsurge in the use of herbal remedies across the world currently. Several reasons could be responsible for this but chiefly due to the increasing failure of orthodox medicine as result of resistance and emergence of new disease conditions.

Herbal remedies are usually crude formulations and therefore are prone to containing impurities some of which have proved very toxic over time. Again it is difficult to determine actual dosage since supposed active substances are in crude and may be in combined forms in the preparations. Users are always in the danger of taking overdose which in itself constitute toxicological challenge. These and other documented evidences have led many to believe that herbal remedies are not safe for administration and must be taken with extreme care if need be.

Again there have been increased advocacy by practitioners and other interested parties for herbal remedies to be recognized and accepted as alternative to orthodox medicine. These advocates cite numerous benefits including proven efficacy in some instances where orthodox pharmaceutical drugs have failed. They argue that herbal remedies are products from natural sources and therefore cannot be as toxic as chemically compounded drugs.

Added to all these is the fact the herbal remedies being natural medicine is environmental friendly.

It is these reasons that informed our decision to investigate the toxic potential of two of such herbal remedies sold across Orumba South LGA of Anambra State especially with sub-chronic use.

Herbal medicine is the source of treatment for many diseases and ailments throughout the developing world [5] because they contain various bioactive principles which have the potential to cause beneficial and/or detrimental effects [6]. Traditionally, people think that medicinal herbs being natural are safe and free from undesirable effects, failing to recognize that herbs are composed of bioactive chemicals some of which may be toxic. Although there is increased acceptance and consumption of herbal remedies worldwide, care must be taken not to consume harmful plants or high doses of plant extracts that could have deleterious effects on vital body organs either in short term or long term. Concerns by medical personnel indicate that herbal medicines may be harmful to vital organs such as liver and kidneys [7].

Toxic effects due to herbal medicine may manifest in a number of organs such as kidney, liver, stomach, nervous system and blood. The liver is a vital organ for maintaining of metabolic functions and detoxification from exogenous and endogenous substances like xenobiotics, drugs and viral infections. When the liver is exposed to such substances, its protective mechanisms are overpowered due to cellular necrosis and increase in serum levels of biochemical parameters like alanine aminotransferase (ALT) and aspartate aminotransferase (AST). Determination of efficacy and safety of herbal remedies is necesssary as many people use them for self medication. For majority of herbal products in use, very little is known about their active and /or toxic constituents. Therefore, this study is set to evalate the prolonged toxic effects of medicinal plant extracts used in treating human diseases, to increases people's confidence with their use [8].

2.0 Materials

2.1 Collection and identification of sample

Goko and BetaB were bought from Eke Ekwulobia market in Anambra State. These were authenticated at the Department of Science Laboratory Technology, Federal Polytechnic Oko, Anambra State, Nigeria.

2.2 Experimental Animals

Adult non pregnant female Wistar albino rats (120 -140 g) were obtained from the animal house, Department of Zoology, University of Nigeria, Nsukka. The animals were randomly distributed into cages and allowed to acclimatize for two weeks in a well ventilated animal house at a room temperature of 24-28^{o}C under normal day light/night cycle. The animals were fed normal feed (Vital Feeds) and water daily. All the animals used in this study were handled in accordance with the international, national and institutional guidelines for care and use of laboratory animals in Biomedical Research as promulgated by the Canadian Council of Animal Care (2009).

2.3 Methods: Experimental Design

Experimental animals were divided into five (5) groups with five rats each.

Group 1 received 0.1 ml/kg body weight of BetaB

Group 2 received 0.2 ml/kg body weight of BetaB

Group 3 received 0.1 ml/kg body weight Goko

Group 4 received 0.2 ml/kg body weight Goko

Group 5 (control) received standard feed and water only

The administration lasted for 14 days (2 weeks), at the end blood was collected through ocular puncture into plain sample bottles. Blood samples collected from these animals were centrifuged at 2000 rpm for 10 mins to obtain clear sera for biochemical assay.

2.4 Determination of Biochemical parameters

Serum concentrations of albumin and bilirubin, were determined according to methods of Doumas *et al.,* [9] Jendrassik and Grof [10] as contained in Randox Kits. Serum alkaline phosphatase, alanine aminotransferase and alanine aminotransferase activity were determined according to method of Reitman and Frankel [11].

3.0 Results

3.1 Table 1: Effect of administration of Goko and BetaB on serum activities of AST, ALT and ALP

in Wistar albino rats.

Groups experiments	AST activities (IU/L)	ALT activities (IU/L)	ALP activities
Normal control	73.75±4.35^{b}	21.00±0.82^{a}	20.00±0.82^{a}
Bitter (0.1ml)	68.50±1.29^{c}	19.25±1.70^{b}	22.50±1.91^{b}
Bitter (0.2ml)	94.25±5.67^{a}	19.25±1.50^{b}	23.75±0.96^{a}
Goko (0.1ml)	68.75±0.96^{a}	18.75±0.95^{b}	24.00±0.82^{a}
Goko (0.2 ml)	76.75±3.94^{b}	22.00±1.66^{a}	24.75±1.50^{a}

Data are mean ± standard deviation (n=5)

Table 1 shows the activity of aspartate aminotransferase (AST) of experimental rat groups. There was significant ($P < 0.05$) decrease in AST activities of rats administered 0.1 ml BetaB and Goko (68.50 ± 1.29 IU/L) and 68.75 ± 0.96 IU/L) respectively when compared to those of normal control (73.75 ± 4.35 IU/L). However the AST activities of rats administered 0.2 ml Goko (76.75 ± 3.94^{b}) and BetaB (94.25 ± 5.67^{a}) significantly ($P < 0.05$) increased when compared with the result of normal control.

The ALT activities of rats administered low doses of herbal mixture Goko and BetaB significantly ($P<0.05$) decreased when compared to the normal control. Administration of 0.2 ml, did not alter the ALT activity by BetaB while Goko significantly ($P < 0.05$) increased from 18.75 ± 0.95^{b} to 22.00 ± 1.66^{a} compared to the normal control (21.00 ± 0.82^{a}). ALP activity significantly ($P < 0.05$) increased with increasing dosages of the herbal mixture; Goko and BetaB compared to normal control.

3.2 Table 2: Effect of administration of Goko and BetaB on serum activities of total Bilirubin (T.Bil) and albumin (ALB) in Wistar albino rats.

Groups Experiments	T Bil Concentration (IU/L)	Albumin Concentration (IU/L)
Normal control	0.45 ± 0.02^{a}	4.72 ± 0.30^{a}
Bitter (0.1ml)	0.44 ± 0.03^{a}	4.61 ± 0.30^{a}
Bitter (0.2ml)	0.47 ± 0.03^{a}	4.58 ± 0.10^{a}
Goko (0.1ml)	0.29 ± 0.02^{b}	4.44 ± 0.20^{a}
Goko (0.2 ml)	0.38 ± 0.02^{b}	4.67 ± 0.22^{a}

Data are mean ± standard deviation (n=5)

Table 2 shows the concentration of total bilirubin (T.Bil) in experimental rats. The administration of high dose of Goko (0.2ml) significantly ($P < 0.05$) reduced the T.Bil concentration when compared to the normal control while no significant difference was seen in the administration of BetaB. The administration of different doses of the two herbal mixtures showed no significant ($P > 0.05$) difference in ALB concentration when compared to the normal control

4.0 Discussion

The liver remains indisputably, one of the most important organs in the body. It is charged primarily with the responsibility of detoxification of xenobiotics and harmful endogenous compound to harmless or less harmful states. It works in concert with the kidneys to clear the blood of drugs and toxic substances. The enzymes ALT, AST, and ALP are markers of liver injury [12]

The increase in the plasma activity AST seen in this study may be indicative of liver toxicity and damage. Aspartate aminotransferase is an enzyme that catalyzes the transfer of amino group from aspartate to alpha keto glutarate. It is usually located in the liver and used as a marker of liver function. From the result of the present study, administration of low dose (0.1 ml) herbal medicines indicated a hepatoprotective effect. However, higher dose (0.2 ml) of Bitter elevated the plasma AST activity of rats indicating hepatotoxicity. This clearly calls for caution among on the part of users. These herbal mixtures are compound of different parts of various plants and which will be rich in phytochemicals, some of which are antioxidants and assist in repair of compromised liver integrity. It is obvious that these equally contain some other compound that in higher concentrations are found to be harmful to the body system.

Alanine aminotransferase (ALT) catalyzes the transfer of amino groups from alanine to α-ketoglutarate. It is a valuable liver marker enzyme as it is highly specific to the liver. Elevated activities of ALT in the plasma is a clear indication of hepatic injury. From the present study, administration of low dose of the herbal drugs reduced ALT activity while high dose elevates ALT activity. This observation indicates that at low dose, the herbal drugs may be beneficial to the liver but may be deleterious at higher dose [13]. Studies have shown that the plant contents of herbal medications such as Aloe Vera, Moringa Oleifera and Cinnamonium officinalis have hepatoprotective [14] effects at low dose but toxic at higher dose.

Extracts of some other plants such as *Vernonia amygdalina, Saccharim officinarum, Allium sativum, Zingiber officinale* and others have been shown to possess toxic effect on the liver [15] despite their widely acclaimed health benefits. The ALP is a marker of liver toxicity whose activites in the serum increases with the level of liver damage. This could explain the hepatotoxicity reflected by elevation in ALP activity from the experimental result as shown in table 1.

The administration of dose of Goko significantly ($p < 0.05$) reduced the total bilirubin concentration when compared to normal control thus indicating a beneficial effect. The presence of bilirubin in urine almost always implies liver disease [16]. An implication of this result may be a suggestion that the elevation of liver marker enzymes resulted from acute liver injury and not such that is comprehensive enough to account for total breakdown of the liver. It still calls for caution with use at higher doses.

Table 2 shows the concentration of serum albumin (ALB) in experimental rats. The administration of different doses of Goko and BetaB showed no significant difference ($P< 0.05$) when compared with the control. This shows that this herbal mixture contains little or no toxic substances, although serum albumin is usually normal in liver disease, they not a confirmtory test for liver injury. This equally supports that the earlier suggestion that the extent of damage that led to elevation of liver marker enzymes may be quite high.

4.1 Conclusion

The result of this study suggests that the herbal remedies evaluated (Goko and BetaB) may be safe at low doses but must be taken cautiously at higher doses and with long term use.

4.2 Recommendation

Further studies are advocated on these and other herbal drugs to further investigate their safety levels especially with chronic use and in relation to some other organs of the body.

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